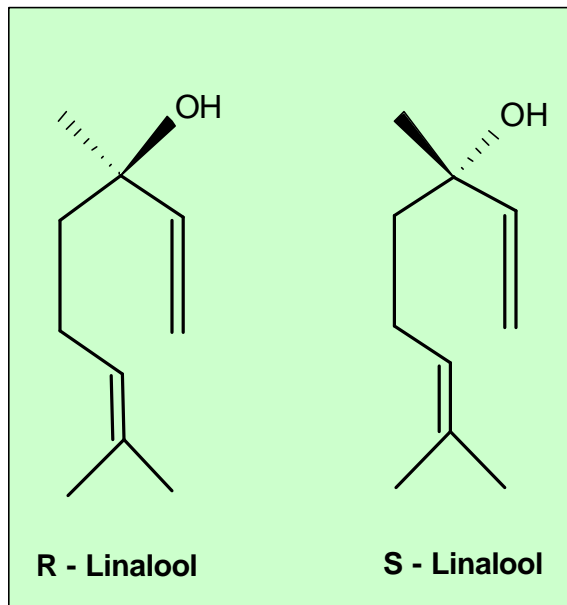


## Hop Oil - Type *NOBLE*

### Chiral Distribution of R- and S-Linalool

#### ❖ Overview

- **Hop Oil - Type *NOBLE*** is produced from leaf hops and contains the complete range of essential oils. However the more volatile, non-polar fraction is significantly reduced by a careful, further processing.
- **Hop Oil - Type *NOBLE*** has especially been developed for addition prior to filtration. Hop oil recovery is considerably improved compared to normal hopping techniques.
- **Hop Oil - Type *NOBLE*** provides a typical, pleasant flowery aroma in beer due to its special composition of aroma substances.



#### ❖ Specification

- **Description:** An almost colorless, clear liquid containing the essential hop oils required for achieving 'noble' hop character.
- **Iso-alpha-acids:** < 0.1%
- **Alpha-acids:** < 0.1%
- **Beta-acids:** < 0.1%
- **Main essential oils:**

Myrcene:	approx. 20%
Humulene:	approx. 2%
Caryophyllene:	approx. 1%
Linalool:	11 - 14%
- **Chiral Distribution of Linalool:**

R - Linalool	94 %
S - Linalool	6 %
- **Density:** 0.8 g/ml

## ❖ Properties

### □ Flavor:

With reduced levels of the undesirable, volatile hydrocarbon fraction, **Hop Oil - Type NOBLE** produces a more subtle and pleasant hop aroma.

Furthermore **Hop Oil - Type NOBLE** has a little influence on beer bitterness. It is therefore very suitable for addition to light stable beers in order to enhance the typical hop character.

### □ Recovery:

As **Hop Oil - Type NOBLE** contains less of the more volatile hop components, it shows better recovery than Hop Oil - Type *DRY*. Depending on the time of addition, hop oil recovery can range between 3 – 90% (see diagram). These figures are only valid if **Hop Oil - Type NOBLE** is used according to the recommendations in section “Product Use”.

### □ Stability:

Tests are currently being carried out to establish product stability.

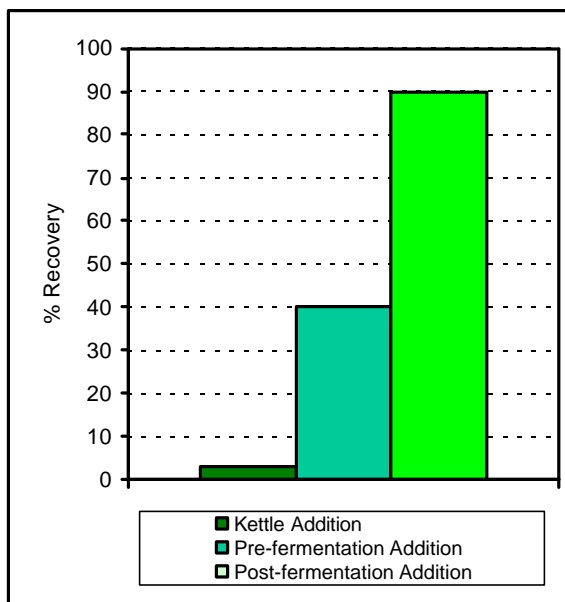
### □ Quality:

All Hopsteiner® products are produced in plants accredited to internationally accepted quality standards.

## ❖ Packaging

**Hop Oil - Type NOBLE** is usually packaged in aluminium bottles containing either 0.5 or 1.0 kg.

Recovery of Hop Aroma Compounds depending on Time of Addition of Hop Oil



## ❖ Product Use

### □ Addition:

**Hop Oil - Type NOBLE** can be added at different stages during beer production. However our recommendation is:

- **Post-fermentation:** Best recovery; direct addition into the beer stream prior to filtration results in hop oils dissolving unchanged into the beer.

The ideal time of addition of **Hop Oil - Type NOBLE** is prior to filtration.

## □ Dosage:

**Hop Oil - Type NOBLE** is offered in **pure form**. The dosage concentration will be decided by the brewer and the quantity of hop oil to be dosed depends on the time and method of addition (**dilution** of pure hop oil in food grade ethanol **1:100** is recommended). A typical addition range is:

- Post-fermentation: 1 – 3 g / hl

The above figure is an indication only; actual additions will depend on the quality and strength of aroma required. Dosing experiments, using a microlitre syringe to inject oil into bright beer, will give useful indications of the target quantity.

## □ Storage:

**Hop Oil - Type NOBLE** should be stored cold in screw top bottles. If cold storage is not possible, the storage temperature should not exceed 20°C (68°F). If aluminium bottles are not used, exposure to light must be avoided.

## □ Safety:

No health hazards in normal use are known; **Hop Oil - Type NOBLE** is non-toxic. If material comes into contact with the skin, wash off with soap and water. If material gets into the eyes, irrigate with excess water and seek medical attention.

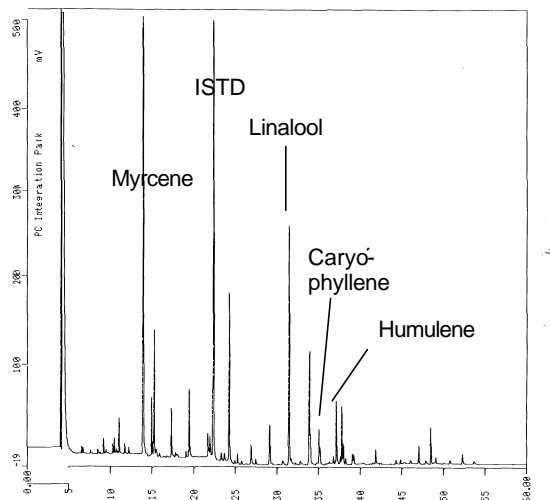
For full safety information please see the relevant Steiner material safety data sheet.

## ❖ Analytical Methods

### □ Composition of Hop Oil Type NOBLE:

For the analysis of individual hop oil components, gas chromatography techniques are used. Details of methods are available on request from Steiner.

## Typical Gas-Chromatogram of Hop Oil - Type NOBLE



## ❖ Technical Support

We will be pleased to offer help and advice on the full range of Hopsteiner® products:

- Copies of all relevant analytical procedures
- Material Safety Data Sheets (MSDS)
- Assistance with pilot or full brewery trials
- Specialist analytical services

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